

Remarks

A Request for Continued Examination is filed herewith.

Applicant thanks the Examiner for the telephone interview held between the examiner and Applicant's attorney, John Conway, on October 7, 2004. In the interview, the teachings of the Kedem reference were discussed. Applicant's attorney pointed out that the Kedem reference teaches creating a mirror of the data in all of the disks of the redundancy group but does not teach mirroring the error correction blocks in the redundancy group. Further, Applicant's attorney stated that a difference between Kedem's system and Applicant's system is that in Applicant's system, all of the blocks on the failed disk drive, including the error-correction data, are reconstructed on the temporary disk drive. Agreement was not reached in this interview.

Claims 1-19 are pending in the application. Claim 19 stands objected to for lack of antecedent basis. Claims 1-15 stand rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement. Claims 16-19 stand rejected as anticipated under 102(e) by U.S. patent no. 6,154,853 to Kedem.

Claims 1 and 16 have been amended to make clear the composition and function of the redundancy group after the group is reconfigured to respond to the disk drive failure. The reconfigured redundancy group consists of the drives of the redundancy group that have not failed and a mirrored subsystem substituting only for the failed disk drive. The mirrored subsystem consists of the failed disk drive and a temporary disk drive. The reconfigured redundancy

group functions in the same fashion as the redundancy group before the disk drive failed. Support for these amendments is provided on page 6, lines 10-20 of the present application. Figure 4 shows the reconfigured redundancy group consisting of the non-failing drives ("B" and "C") and the mirrored subsystem consisting of failed drive "A" and temporary drive "D."

Claim 19 has been amended to provide antecedent basis for all claim limitations in claim 19.

Claim Rejections --- 35 U.S.C. §112, first paragraph

Claims 1-15 stand rejected under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement.

Since the claim limitation "such that the mirrored subsystem includes error correction data from the redundancy group" has been deleted from claim 1, this rejection is now moot. This deletion is made in the interest of prosecuting alternative claims for the invention and does not indicate that Applicant agrees with the assertion that support for the limitation is lacking in the present application.

The Kedem reference (U.S. patent no. 6,154,853) discloses a RAID storage subsystem that includes parity data, such as a RAID-5 configuration. When a disk in the RAID group begins to fail, the data in the RAID group is converted to a fully mirrored configuration using multiple spare disk drives, but the parity data from the RAID group is not mirrored. The mirrored configuration does not perform the functions of the original RAID group, but rather, acts as a mirror, providing redundancy by duplicating the data. Once

the failed drive has been replaced, the mirrored configuration is converted back to a RAID group and the spare drives return to inactive status. This conversion process includes recreating the parity data for the RAID group since the mirror does not include such data.

(See, generally, fig. 6 and col. 4, lines 48-62 of Kedem '853.)

Claim 1, as amended, requires (in part):

"...creating a mirrored subsystem within the array, the subsystem including a temporary disk drive and the failed disk drive slot; and

reconfiguring the redundancy group to consist of the disk drives of the redundancy group that have not failed and the mirrored subsystem, such that the mirrored subsystem is substituted for the failed disk drive in the redundancy group. "

Kedem does not teach a reconfigured group that consists of the disk drives of the redundancy group that have not failed and the mirrored subsystem. Rather, Kedem's reconfiguration includes multiple temporary drives. Kedem does not replace only the failed drive with a mirrored subsystem. Instead, Kedem teaches supplying enough temporary disk drives that all of the data in the redundancy group (but not the parity blocks) may be duplicated, forming a fully mirrored configuration. In contrast, in the embodiment of the present invention required by claim 1, the reconfigured group consists of the working disk drives and the created mirror subsystem because only the failed disk drive is mirrored. The full function of the redundancy group is restored with the mirrored subsystem substituting only

for the failed disk drive. This arrangement advantageously requires only a single spare disk drive and fully restores the function of the redundancy group until a replacement drive can be swapped for the failed drive.

Since Kedem does not teach a required limitation of claim 1, Kedem cannot anticipate claim 1. Claims 2-15, which depend from claim 1 and add further limitations, are allowable over Kedem for at least the same reasons as for claim 1.

Claim Rejections --- 35 U.S.C. §102(e)

Claims 16-19 stand rejected as anticipated under 102(e) by U.S. patent no. 6,154,853 to Kedem.

Claim 16 has been amended to require (in part):

“...creating a mirrored subsystem within the array using a temporary disk drive and the failed disk drive slot;  
reconfiguring the redundancy group to consist of the disk drives of the redundancy group that have not failed and the mirrored subsystem, such that the mirrored subsystem is substituted for the failed disk drive in the redundancy group; and...”

As stated above, Kedem does not teach, disclose or suggest a method of restoring the full function of a redundancy group with a reconfigured group that consists of the disk drives of the redundancy group that have not failed and a mirrored subsystem. Kedem teaches supplying enough temporary disk drives that all of the data in the redundancy group (but not the parity blocks) may be duplicated, forming a fully mirrored configuration. In contrast, in the embodiment of the present invention required by claim 16, only the failed disk

drive is mirrored and the function of the redundancy group is restored with the mirrored subsystem substituting only for the failed disk drive.

Since Kedem does not teach required limitations of claim 16, Kedem cannot anticipate claim 16. Claim 17, which depends from claim 16 and adds further limitations, is allowable over Kedem for at least the same reasons as claim 16.

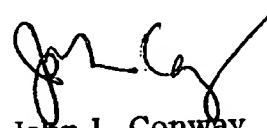
Likewise, claim 18 requires that the redundancy group be reconfigured with the mirrored subsystem substituting only for the failed disk drive. Thus, claim 18 is allowable over Kedem for the same reasons as for claim 16. Claim 19, which depends from claim 18 and adds further limitations, is allowable over Kedem for at least the same reasons as for claim 18.

Claim Objection – Antecedent Basis.

Claim 19 stands objected to for lack of antecedent basis for “the replacement drive” in line 3. Claim 19, as amended, now contains antecedent basis for each claim term.

The Commissioner is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith to our Deposit Account No. 19-4972. Applicants request reconsideration of the rejected claims and a notice of allowance. The Examiner is requested to telephone the undersigned if any matters remain outstanding so that they may be resolved expeditiously.

Respectfully submitted,



John L. Conway  
Registration No. 48,241  
Attorney for Applicant

Bromberg & Sunstein LLP  
125 Summer Street  
Boston, MA 02110-1618  
(617) 443-9292

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